Chicago O'Hare International Airport

NOTE: This document is a suggested guideline for conducting the O'Hare Modernization Program (OMP) air quality analyses. It is provided for deliberative purposes only and is based on previously approved air quality methodologies and assumptions used in the preparation of the air quality analysis for O'Hare's World Gateway Program Environmental Assessment. This Air Quality Analysis Protocol is being developed through close coordination with the Federal Aviation Administration (FAA) and associated contractors, the City of Chicago Department of Aviation, the US Environmental Protection Agency (USEPA) Region V, and the Illinois EPA (IEPA). This Protocol is based on information that the City of Chicago has provided to the FAA to date. If major components of the OMP are changed and/or phasing is altered, this Protocol will be adjusted by FAA as necessary, in consultation with USEPA and IEPA.

Draft

Air Quality Analysis Protocol – Criteria Pollutants

O'Hare Modernization Program Environmental Impact Statement

August 5, 2003

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Chapter 1 Project Background

The City of Chicago Department of Aviation (City) is proposing a program to modernize O'Hare International Airport (Airport). Known as the O'Hare Modernization Program (OMP), the program includes the addition of one new runway and the relocation of three existing runways into an east-west configuration. The future airport, as currently envisioned by the City, would consist of eight runways (six east-west parallel runways and two northeast-southwest parallel runways). The OMP could also involve relocation of some or all of the existing navigation aids, placement of new navigation aids, provision for a new western access to the Airport, construction of additional terminal facilities, and relocation of various roadway and rail line. Based on the potential impacts associated with the proposed developments, the Federal Aviation Administration (FAA) has determined that the environmental review process will be in the form of an Environmental Impact Statement (EIS).

As part of the air quality analysis for the EIS, emission inventories will be prepared and dispersion modeling will be conducted. The results of these efforts will be evaluated to ensure the OMP complies with all applicable state and Federal laws, including the National Environmental Policy Act (NEPA), the Clean Air Act (CAA), and FAA Orders 1050.1D and 5050.4A.

Additional details regarding the OMP and graphics illustrating the airfield development concept and airfield evolution can be viewed at http://modernization.ohare.com/program_pages/configuration.htm.

This Protocol identifies the technical assumptions, methodologies, databases, and models that will be used to conduct the air quality analysis for the OMP EIS. The purpose of the Protocol is to document, in advance of any data collection or data analysis, the approach to the criteria pollutant analysis. The document will be circulated to the US Environmental Protection Agency (USEPA) and the Illinois Environmental Protection Agency (IEPA) to ensure that the approach meets regulatory needs and requirements.

During scoping, issues related to hazardous air pollutants were identified by the USEPA and the IEPA. A separate Protocol will be prepared to document the approach to this air quality concern.

1.1 Regional Air Quality Status

The State of Illinois and the federal government have Ambient Air Quality Standards (AAQS) for six air pollutants—ozone (O3), carbon monoxide (CO), nitrogen dioxide (NO2), sulfur dioxide (SO2), particulate matter less than 10 microns in size (PM_{10}) and lead (Pb). The standards were established to protect the health and welfare of the public. **Table 1** presents a summary of the current and future National and Illinois AAQS.

The Airport is located within Cook and DuPage counties. Based on historical air monitoring data, these two counties, along with six other counties (two located in Indiana) and the Townships of Aux Sable and Goose Lake in Grundy County and Oswego in Kendall County, are currently designated by the USEPA to be a severe-17 nonattainment area for the one-hour AAQS for O3. The nonattainment area is located within Air Quality Control Region (AQCR) 67 (the Metropolitan Chicago Interstate AQCR).

Table 1. National and Illinois Ambient Air Quality Standards[1]

Pollutant	Averaging Time	Primary Standards[2]		Secondary Standards[2]	
		μg/m³	ppm	μg/m³	ppm
Carbon Monoxide (CO)	1-hour	40,000	35	same as primary	same as primary
	8-hour	10,000	9	same as primary	same as primary
Ozone (O_3)	1-hour	235	0.12	same as primary	same as primary
	8-hour[3]		0.08	same as primary	same as primary
Nitrogen Dioxide (NO_2)	Annual	100	0.053	same as primary	same as primary
Sulfur Dioxide (SO_2)	3-hour	none	none	1,300	0.5
	24-hour	365	0.14	none	none
	Annual	80	0.03	none	none
Particulate Matter (PM_{10})	24-hour	150	--	same as primary	--
	Annual	50	--	same as primary	--
Particulate Matter ($PM_{2.5}$)	24-hour[3]	65	--	same as primary	--
	Annual[3]	15	--	same as primary	--
Lead (Pb)	Quarterly Mean	1.5	--	same as primary	--

[1] Federal and Illinois standards, except for annual means, are not to be exceeded more than once per year.

[2] The tabulated thresholds are for primary standards which are for protection of public health. Secondary standards are for protection of public welfare.

[3] The State of Illinois has not adopted the $PM_{2.5}$ or 8-hour ozone standards at this time. An area will meet the 8-hour ozone standard when the average fourth-highest daily maximum 8-hour average is less than or equal to the threshold.
40 CFR Part 50.12, *National Primary and Secondary Ambient Air Quality Standards for Lead* 35 IAC Part 243, Air Quality Standards.

1.1.1 Status of the State Implementation Plan (SIP)

On November 13, 2001, the USEPA approved a State Implementation Plan (SIP) revision submitted by the IEPA (effective December 13, 2001). The revision met certain requirements of the CAA regarding attainment of the 1-hour O3 standard in the Chicago-Gary-Lake County O3 nonattainment area (which includes Cook and DuPage counties where the Airport is located).[1] The approved SIP revision included:

- A plan that demonstrates attainment of the 1-hour O3 standard by November 15, 2007,
- A post-1999 ozone rate-of-progress (ROP) plan with mobile source conformity emission budgets,
- Contingency plans for the attainment demonstration and the ROP plan,
- A commitment to conduct a Mid-Course Review (MCR) of the attainment demonstration,
- Year 2002, 2005, and 2007 motor vehicle emission budgets for volatile organic compounds (VOC) and year 2007 oxides of nitrogen (NOx) (to be revised within two years of release of the MOBILE6 program), and
- A demonstration that the State has fully implemented Reasonably Available Control Measures (RACM).

The SIP identifies emissions from all sources in the nonattainment area for the years 1990, 1996, and 1999. Regional emissions are described below. Emissions attributable to aircraft are also described.

[1] Federal Register: November 13, 2201 (Volume 66, Number 219, Pages 56903-56931)

Volatile Organic Compounds (VOC)

As shown in **Table 2**, the amount of VOC emitted within the nonattainment area in the years 1990, 1996, and 1999 totaled approximately 1,363, 941, and 953 tons per day during the summer months.

The largest sources of VOC emissions within the nonattainment area were mobile sources. Mobile sources include on- and off-highway motor vehicles, such as locomotives, commercial vessels, pleasure boats, aircraft, airport service equipment (ASE), and construction equipment. During 1990, 1996, and 1999, the VOC emissions from all aircraft and ASE activity at all airports within the nonattainment area totaled approximately 10, 9, and 9 tons per day—less than 1 percent of regional emissions.[2] VOC emissions from construction activities within the area during these same years were approximately 13, 14, and 15 tons per day—less than 2 percent of regional emissions.

Oxides of Nitrogen (NOx)

As shown in **Table 3**, the amount of NOx emitted within the nonattainment area in the years 1990, 1996, and 1999 totaled approximately 1,022, 1,030, and 1,001 tons per day during the summer months.

The largest sources of NOx emissions within the nonattainment area were mobile sources. During 1990, 1996, and 1999, the NOx emissions from all aircraft and ASE activity at all airports within the nonattainment area totaled approximately 28, 32, and 33 tons per day—approximately 3 percent of regional emissions.[2] NOx emissions from construction activities within the area during these same years were approximately 81, 93, and 92 tons per day—less than 10 percent of regional emissions.

Carbon Monoxide (CO)

As shown in **Table 4**, the amount of CO emitted within the nonattainment area in the years 1990, 1996, and 1999 totaled approximately 4,750, 3,103, and 2,908 tons per day during the summer months. Of this total, mobile sources contributed 84 percent in 1990 and 96 percent in 1999.

The largest sources of CO emissions within the nonattainment area were mobile sources. During 1990, 1996, and 1999, the CO emissions from aircraft activity within the nonattainment area were approximately 40, 35, and 35 tons per day--approximately 1 percent of regional emissions.[3]

2007 Aircraft Emissions

Based on information incorporated in to the Chicago Attainment Demonstration SIP, the IEPA has projected that during the year 2007, all aircraft and ASE activity within the nonattainment area will contribute approximately 13 tons per day to regional totals of VOC, with construction activity contributing approximately 15 tons per day to the total. During this same year, all aircraft and ASE activity will contribute approximately 39 tons to the regional totals of NOx, with construction activity contributing approximately 86 tons per day to the total. [2]

[2] Correspondence – Mike Rogers, IEPA, January 14, 2003.

[3] The 1990 Ozone Precursors Emissions Inventory for the Chicago Area, Illinois State Implementation Plan. IEPA. Nov 1993, the Illinois 1996 Periodic Inventory and Milestone Demonstration, IEPA. Sept 1999, and the 1999 Illinois Periodic Emissions Inventory, IEPA. Dec 2001.

Table 2. Summer Weekday Emissions of VOC (Tons Per Day)[a]

Source Categories	1990				1996				1999			
	Point	Area	Mobile	Total	Point	Area	Mobile	Total	Point	Area	Mobile	Total
Storage, Transportation & Marketing of VOC	21.46	56.10	0.00	77.56	17.09	14.84	0.00	31.93	10.58	14.96	0.00	25.54
Industrial Processes	143.31	0.00	0.00	143.31	42.05	0.00	0.00	42.05	37.08	0.00	0.00	37.08
Industrial Surface Coating	104.33	0.00	0.00	104.33	38.12	0.00	0.00	38.12	27.87	0.00	0.00	27.87
Non-Industrial Surface Coating	0.00	79.37	0.00	79.37	0.00	66.12	0.00	66.12	0.00	53.26	0.00	53.26
Other Solvent Use	46.28	116.22	0.00	162.50	18.64	121.41	0.00	140.05	15.35	88.32	0.00	103.67
Waste Disposal	23.33	3.39	0.00	26.72	10.64	2.99	0.00	13.63	11.95	3.75	0.00	15.70
Other Miscellaneous[b]	11.37	12.93	0.00	24.30	9.91	14.98	0.00	24.89	9.26	13.59	0.00	22.85
Mobile – On Road[c]	0.00	0.00	491.22	491.22	0.00	0.00	268.48	268.48	0.00	0.00	241.77	241.77
Mobile – Off Road[c]	0.00	0.00	144.28	144.28	0.00	0.00	145.19	145.19	0.00	0.00	133.44	133.44
Total Anthropogenic	350.08	268.01	635.50	1253.59	136.45	220.34	413.67	770.46	112.09	173.88	375.21	661.18
Biogenic	--	109.81	--	109.81	--	170.70	--	170.70	--	292.43	--	292.43
TOTAL	350.08	377.82	635.50	1363.40	136.45	391.04	413.37	941.16	112.09	466.31	375.21	953.61
Aircraft[d]	--	--	7.92	--	--	--	6.28	--	--	--	6.33	--
Airport Service Equipment[e]	--	--	2.27	--	--	--	2.38	--	--	--	2.44	--
Construction Equipment[e]	--	--	12.70	--	--	--	14.41	--	--	--	14.87	--

[a] Chicago ozone nonattainment area and major sources within 25 miles.
[b] Excludes biogenic sources.
[c] Includes aircraft, airport service equipment, and construction equipment.
[d] Nonattainment area estimates for all military, commercial, and general aviation aircraft and refueling activities.
[e] Nonattainment area estimates for all 2-stoke and 4-stroke gasoline and diesel construction activities.
Source: IEPA

Table 3. Summer Weekday Emissions of NOx (Tons Per Day)[a]

Source Categories	1990				1996				1999			
	Point	Area	Mobile	Total	Point	Area	Mobile	Total	Point	Area	Mobile	Total
External Fuel Combustion	202.76	21.64	0.00	224.40	222.40	25.78	0.00	248.18	214.29	28.88	0.00	243.17
Stationary Internal Combustion	28.46	0.00	0.00	28.46	20.09	0.00	0.00	20.09	31.80	0.00	0.00	31.80
Other Combustion	3.56	2.19	0.00	5.75	0.58	4.23	0.00	4.81	2.77	3.95	0.00	6.72
Industrial Processes	55.90	0.00	0.00	55.90	32.59	0.00	0.00	32.59	27.20	0.00	0.00	27.20
Mobile – On Road	0.00	0.00	540.26	540.26	0.00	0.00	520.00	520.00	0.00	0.00	495.94	495.94
Mobile – Off-Road[b]	0.00	0.00	167.51	167.51	0.00	0.00	185.20	185.20	0.00	0.00	186.89	186.89
TOTAL	290.68	23.83	707.77	1022.28	275.66	48.69	705.20	1029.55	276.06	42.59	682.83	1001.48
Aircraft[c]	--	--	14.37	--	--	--	17.30	--	--	--	19.61	--
Airport Service Equipment[d]	--	--	13.88	--	--	--	14.48	--	--	--	13.77	--
Construction Equipment[d]	--	--	80.67	--	--	--	92.58	--	--	--	92.33	--

[a] Chicago ozone nonattainment area and major sources within 25 miles.
[b] Includes aircraft, airport service equipment, and construction equipment.
[c] Nonattainment area estimates for all military, commercial, and general aviation aircraft and refueling activities.
[d] Nonattainment area estimates for all 2-stoke and 4-stroke gasoline and diesel construction activities.
Source: IEPA

Table 4. Summer Weekday Emissions of CO (Tons Per Day)[a]

Source Categories	1990				1996				1999			
	Point	Area	Mobile	Total	Point	Area	Mobile	Total	Point	Area	Mobile	Total
External Fuel Combustion	18.33	4.06	0.00	22.39	62.47	4.68	0.00	67.15	40.24	3.17	0.00	43.41
Stationary Internal Combustion	6.06	0.00	0.00	6.06	14.71	0.00	0.00	14.71	13.64	0.00	0.00	13.64
Other Combustion	4.15	18.40	0.00	22.55	2.03	17.11	0.00	19.14	2.56	17.48	0.00	20.04
Industrial Processes	688.26	0.00	0.00	688.26	52.67	0.00	0.00	52.67	36.86	0.00	0.00	36.86
Mobile – On Road	0.00	0.00	2924.41	2924.41	0.00	0.00	1780.08	1780.08	0.00	0.00	1576.90	1576.90
Mobile – Off Road	0.00	0.00	1086.60	1086.60	0.00	0.00	1170.09	1170.09	0.00	0.00	1217.93	1217.93
TOTAL	716.80	22.46	4011.01	4750.27	131.88	21.79	2950.17	3103.84	93.30	20.66	2794.83	2908.79

[a] Chicago ozone nonattainment area and major sources within 25 miles.
Source: IEPA

1.2 Air Pollutant Monitoring Network

The IEPA and other air quality agencies own, maintain, and operate a network of over 200 air quality monitoring stations throughout the State of Illinois. **Figure 1** illustrates the locations of the monitoring stations within Cook and DuPage counties with respect to the Airport. As shown, there are currently 33 monitoring stations located within Cook County and two stations within DuPage County. **Table 5** details information for each monitor including the cities/areas in which each monitor is located, the owners/operators of the equipment, and the specific pollutants/parameters measured.

1.3 Future Air Quality Considerations

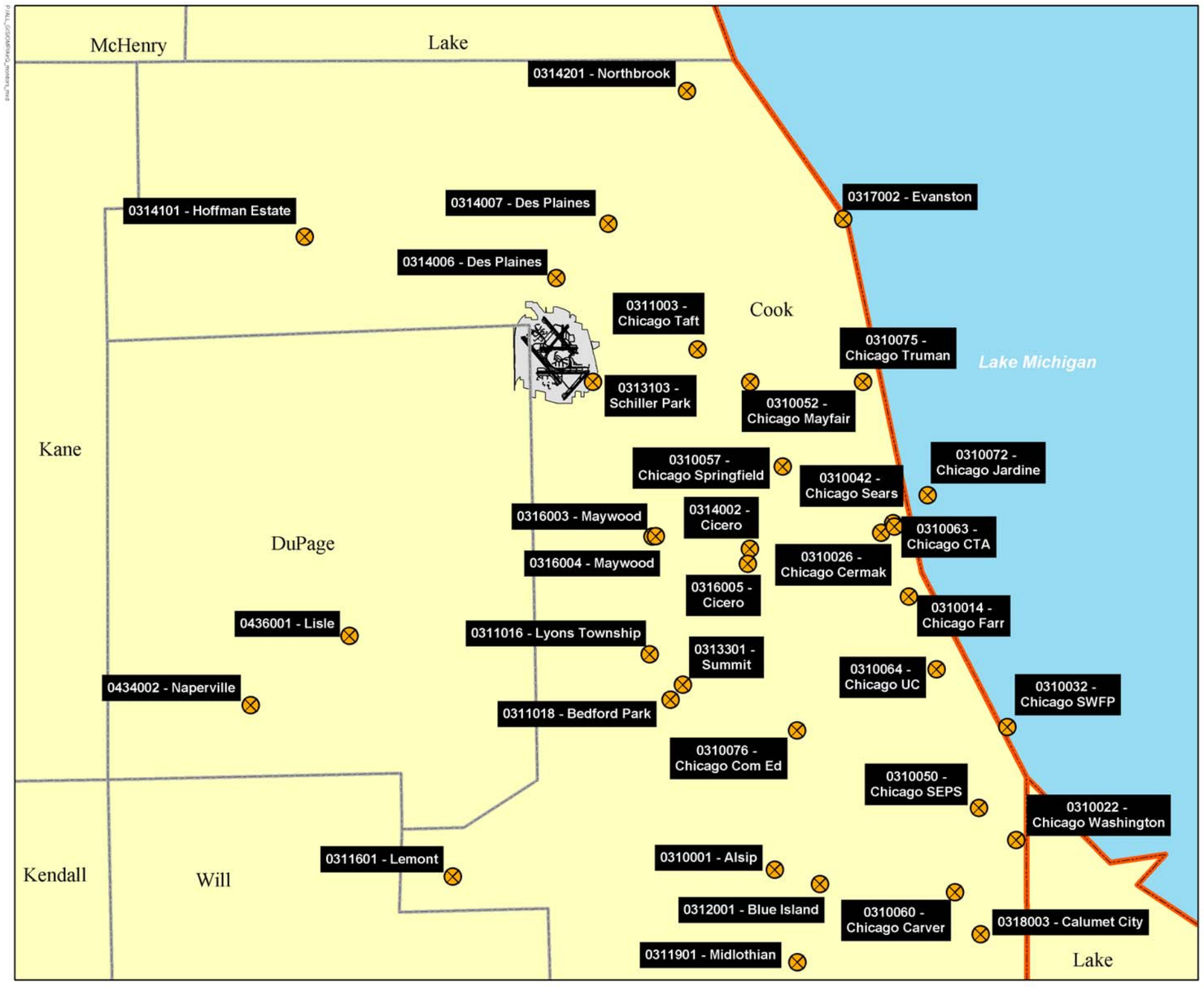
1.3.1 New O3 Standard

In July 1997, the USEPA adopted a new National 8-hour average O3 AAQS at a level of 0.08 ppm. This revised O3 standard was challenged by several industry groups in federal court. In 1999, the D.C. Circuit Court of Appeals ruled that USEPA could revise the standard, but could not enforce the standard. This ruling was appealed and the U.S. Supreme Court unanimously determined that the new standard for O3 was constitutional and USEPA was correct in not considering costs when setting the new limits. However, the Supreme Court determined that the USEPA implementation policy for the new standard was unlawful and left it up to USEPA after the D.C. Circuit's final disposition of the case to develop a reasonable interpretation of the nonattainment implementation provisions. In 2002, the D.C. Circuit addressed certain unresolved issues raised by the industry groups, and found for USEPA. On January 6, 2003, USEPA reaffirmed its 0.08 ppm/8-hour standard in the Federal Register. Although USEPA has held public meetings on O3 implementation, USEPA has not yet issued a proposed revised implementation rule.

Following promulgation of a new or revised air quality standard such as this, the CAA requires the Governor of each State to recommend initial designations of the attainment status for all areas of the State (42 U.S.C. 7401(d)). Ordinarily this is required within 1 year of the promulgation of a new standard. But, according to Public Law No. 105-178, passed in June of 1998, the Governor of each State was required to submit the designations referred to in Section 107(d)(1) of the Clean Air Act within 2 years following the promulgation of the July 1997 O3 National AAQS.

To make the recommendation, the IEPA evaluated O3 data collected from 1997 to 1999, as well as factors such as planned emission reduction strategies, spatial patterns of precursor emissions near and upwind of the monitors not meeting the standard, and projected economic and population growth patterns as they relate to an expected growth in precursor emissions. Based on the evaluation, the IEPA recommended to the USEPA that the boundaries of the 8-hour AAQS nonattainment area remain the same as for the 1-hour standard. The designation for the area will likely be official in the year 2004.

The dispersion model that will be used in the OMP analysis does not have the capability of predicting concentrations of O3 for comparison with the AAQS. The formation of O3 in the atmosphere is complex to model on a local scale and the effects of elevated O3 concentrations are generally realized on a regional scale rather than a local level. However, where possible, the air quality analyses for the OMP will include information relevant to the new standard.



O'Hare Modernization Program

Chicago O'Hare International Airport
City of Chicago Richard M. Daley, Mayor

LEGEND

- Air Quality Monitor Sites - Aerometric Information Retrieval System (AIRS) Code
- Water
- O'Hare Property Line
- States
- Counties

0 8
Miles

NORTH

Air Quality Monitors for Cook and DuPage Counties

Source: 2001 Illinois Annual Air Quality Report, Illinois Environmental Protection Agency, IEPA/BOA/02-015, August 2002.

FIGURE 1

X-XX

Table 5. Air Pollutant Monitoring Stations (Cook and DuPage Counties)

Distance to ORD* (miles)	City Name	AIRS Code	Owner/Operator	WS	WD	O_3	SO_2	NO/ NO_2	CO	Pb	TSP	PM_{10}	$PM_{2.5}$	VOC	SOL	UV	MET	Rain
1.8	Schiller Park	0313103	IEPA	(d)	(d)			(a)	(a)	(a)	(d)							
3.2	Des Plaines-FES	0314006	Cook County DEC			(a)												
5.8	Chicago-Taft	0311003	Cook County DEC			(a)												
5.8	Des Plaines-ROB	0314007	IEPA										(a)					
8.1	Chicago-Mayfair	0310052	Cook County DEC							(b)	(d)		(a)					
8.5	Maywood-MCC1	0316004	Cook County DEC						(b)									
8.6	Maywood-MCCM	0316003	Cook County DEC							(b)								
10.4	Chicago-SPS	0310057	Cook County DEC										(a)					
11.3	Cicero-Liberty	0316005	Cook County DEC										(a)					
11.6	Hoffman Estates	0314101	Cook County DEC									(a)						
11.7	Cicero-51st	0314002	Cook County DEC			(a)	(b)	(b)	(a)									
12.2	Northbrook	0314201	IEPA	(c)	(c)	(c)		(c)					(a)	(c)	(c)		(c)	
12.7	Chicago-Truman	0310075	Cook County DEC			(a)		(a)										
13.0	Lyons Township	0311016	Cook County DEC									(a)	(a)					
13.1	Evanston	0317002	IEPA	(d)	(d)	(b)												
14.5	Lisle	0436001	IEPA	(d)	(d)	(a)												
14.6	Summit	0313301	Cook County DEC							(a)	(d)	(a)	(a)					
15.1	Bedford Park	0311018	Cook County DEC	(d)	(d)		(a)											
15.3	Chicago-Cermak	0310026	Cook County DEC							(a)	(d)							
15.6	Chicago-Sears	0310042	IEPA			(d)												
15.7	Chicago-CTA	0310063	IEPA				(b)	(b)	(b)									
16.4	Chicago-Jardine	0310072	IEPA	(c)	(c)	(c)		(c)						(c)	(c)	(c)	(c)	(c)
17.7	Chicago-Farr	0310014	Cook County DEC										(a)					
18.5	Chicago-ComEd	0310076	Cook County DEC	(d)	(d)								(a)					
19.3	Naperville	0434002	IEPA										(a)					
20.4	Chicago-UC	0310064	Cook County DEC			(a)									(d)			
22.1	Lemont	0311601	Cook County DEC			(a)	(a)											
23.2	Alsip	0310001	Cook County DEC	(d)	(d)	(a)				(a)	(d)	(a)						
24.2	Chicago-SWFP	0310032	Cook County DEC			(a)												

Table 5. Air Pollutant Monitoring Stations (Cook and DuPage Counties) - Continued

Distance to ORD* (miles)	City Name	AIRS Code	Owner/Operator	WS	WD	O_3	SO_2	NO/ NO_2	CO	Pb	TSP	PM_{10}	$PM_{2.5}$	VOC	SOL	UV	MET	Rain
24.5	Blue Island	0312001	Cook County DEC				(a)					(b)	(a)					
25.7	Chicago-SEPS	0310050	Cook County DEC			(a)	(b)						(a)					
27.1	Midlothian	0311901	Cook County DEC									(a)						
27.7	Chicago-Wash.	0310022	Cook County DEC							(a)	(d)		(a)					
27.7	Chicago-Carver	0310060	Cook County DEC									(b)						
29.8	Calumet City	0318003	Cook County DEC			(a)	(a)	(a)	(a)									
TOTALS				8	8	15	7	7	5	7	6	7	13	2	3	1	2	1

(a) Pollutant monitored as part of the State/Local Air Monitoring Station (SLAMS) Network

(b) Pollutant monitored as part of the National Air Monitoring Station (NAMS) Network

(c) Pollutant monitored as part of the Photochemical Assessment Monitoring Station (PAMS) Network

(d) Pollutant monitored as part of the Special Purpose Monitoring Station (SPMS) Network

* Distance is to the Airport Reference Point (ARP), which is close to the geographic center of Chicago O'Hare International Airport.

Source: Illinois Annual Air Quality Report – 2001. Illinois Environmental Protection Agency, Bureau of Air. IEPA/BOA/02-015. August 2002.

WS = Wind Speed
WD = Wind Direction
O_3 = Ozone
SO_2 = Sulfur Dioxide
NO = Nitric Oxide
NO_2 = Nitrogen Dioxide
CO = Carbon Monoxide
Pb = Lead
TSP = Total Suspended Particulates
PM_{10} = Particulate Matter (10 micrometers or smaller)
$PM_{2.5}$ = Particulate Matter (2.5 micrometers or smaller)
VOC = Volatile Organic Compounds
SOL = Total Solar Radiation
UV = Ultra-Violet Radiation
MET = Temperature, Relative Humidity, Barometric Pressure
Rain = Rainfall

1.3.2 Revised PM Standard

In July 1997, the USEPA revised the PM_{10} National AAQS for PM up to 10 microns in diameter by creating a $PM_{2.5}$ standard for PM up to 2.5 microns in diameter as follows:

- Creating a new size-specific indicator for particulate matter, collecting particles with a nominal diameter of 2.5 microns or less
- Creating a new annual $PM_{2.5}$ standard of 15 ug/m3
- Creating a new 24-hour $PM_{2.5}$ standard of 65 ug/m3
- Retaining the current 24-hour PM_{10} standard of 150 ug/m3

This revised PM standard was challenged by several industry groups in federal court, along with the revised O3 standard (see Section 1.3.1, above), but was ultimately upheld.

In anticipation of the revised standard and pursuant to CAA Section 110(a)(2)(B), the IEPA began collecting $PM_{2.5}$ ambient data to determine $PM_{2.5}$ nonattainment boundaries. In 2000, IEPA completed it's $PM_{2.5}$ network and currently monitors this pollutant at 35 locations statewide, with twelve of the stations located in Cook County and one in DuPage County. The USEPA does not expect to designate areas to be in attainment or nonattainment with the new particulate standards until 2003 or 2004. IEPA will then submit a plan for meeting the new standards to USEPA, and will implement that plan upon its approval by USEPA.

Data (emission factors) for $PM_{2.5}$ from the sources that will be included in the OMP analysis are limited. However, where possible, the air quality analyses for the OMP will include information relevant to the new standard.

1.4 Applicable Regulations

As previously stated, the results of the air quality analysis will be evaluated to ensure the OMP complies with all applicable state and Federal laws, including the NEPA, the CAA, and FAA Orders 1050.1D and 5050.4A. The following subsections provide brief summaries of the requirements of these documents.

1.4.1 NEPA

The National Environmental Policy Act of 1969 (NEPA) establishes national environmental policies that apply to the federal government as a whole and prescribes certain procedural requirements for federal agency actions. Except as otherwise provided by Congress, the Act applies to all federal agency actions, including those that intersect with non-federal activities (e.g. through a federal permit or funding), although its requirements may vary depending on the nature of the action involved.

NEPA establishes a national environmental policy that makes it the continuing responsibility of the federal government to use all practicable means, consistent with other essential considerations of national policy, to improve and coordinate federal plans, functions, programs, and resources to the end that the nation may: (1) assure for all Americans safe, healthful, productive, and aesthetically and culturally pleasing surroundings; and (2) attain the widest range of beneficial uses of the environment without degradation, risk to health or safety, or other undesirable and unintended consequences. In addition to these general duties, NEPA requires all federal agencies to do certain specific things, such as the preparation of an EIS for any major federal action significantly affecting the quality of the human environment.

As a federal agency, FAA is required under NEPA to prepare an environmental document for major federal actions that have the potential to affect the quality (including air quality) of the human environment. An air quality assessment prepared for inclusion in a NEPA environmental document includes an analysis and conclusion regarding the proposed action's impacts on air quality.

1.4.2 CAA

The CAA (42 U.S.C. 7401 et seq) seeks to protect human health and the environment from emissions that pollute ambient, or outdoor, air. Among other things, it requires the USEPA to establish minimum national standards for air quality (the AAQS), and assigns primary responsibility to the states to assure compliance with the standards. States then do so by submitting State Implementation Plans (SIPs) for USEPA approval. Areas not meeting the standards, referred to as nonattainment areas, are required to implement specified air pollution control measures.

One of the essential components of the CAA strategies to achieve and maintain the AAQS is known as "conformity". Conformity requirements are addressed in Section 176(c)(1) of the CAA. These requirements are intended to ensure that the federal government does not take, approve, or support actions that are inconsistent with a state's plan to attain and maintain the AAQS. A demonstration of conformity is a demonstration that an action is consistent with a State Implementation Plan (SIP).

1.4.2.1 General Conformity Requirements

The USEPA established the General Conformity Rule on November 30, 1993. The General Conformity Rule implements the CAA conformity provision. The General Conformity Rule divides the conformity process into two areas: applicability analysis and conformity determination. Federal agencies must initially assess if an action is subject to the Conformity Rule (applicability analysis) and then if the action conforms to implementation plans (conformity determination). The applicability analysis requires federal agencies to identify, analyze, and quantify emission impacts of an action. It should be noted that while the conformity process is separate from the NEPA process, the conformity analysis can be completed concurrently with the NEPA analysis.

Applicability Analysis

General conformity applies to all actions in nonattainment or maintenance areas not specifically covered by transportation conformity. To determine whether general conformity requirements apply to an action, a federal agency must (1) consider the nonattainment and maintenance status of an area; (2) the exemptions from and presumptions to conformity; (3) the project's emissions and (4) the regional significance of the project's emissions.

First, for general conformity to be applicable, the action must be located in an area that is nonattainment or maintenance for any of the National AAQS found in 40 CFR 93.153(b)(1) and (2). Second, the action must not be exempt or presumed to conform, pursuant to 40 CFR 93.153(c)-(h). Third, the proposed action's net annual emissions (proposed federal action emission levels--which is the sum of the direct and indirect emissions, including construction emissions, minus the no action

emission levels) must equal or exceed the National AAQS *de minimis* levels identified in 40 CFR 93.153(b)(1) and (2).[4] Fourth, even if the action is presumed to conform or does not exceed the *de minimis* levels, the action is still subject to a general conformity determination if the action is "regionally significant" pursuant to 40 CFR 93.153(i). An action is defined as being "regionally significant" when the emissions from the action represent 10 percent or more of a nonattainment or maintenance area's total emissions of the applicable pollutant. (40 CFR 93.152)

Conformity Determination

Once the conformity regulations are deemed to be applicable to the particular federal action pursuant to 40 CFR 93.153, the next question is whether the general federal action conforms with the applicable SIP pursuant to the criteria of 40 CFR 93.158. This regulation specifies that an action within an O3 nonattainment area conforms with the applicable SIP where the action: (1) complies with 40 CFR 93.158(c)[5] and (2) meets any of the following requirements:

- The total of direct and indirect emissions from the action are specifically identified and accounted for in the applicable SIP's attainment or maintenance demonstration;

- The total of direct and indirect emissions from the action are fully offset within the same nonattainment or maintenance area through a revision to the applicable SIP or a similarly enforceable measure that effects emission reductions so that there is no net increase in emissions of that pollutant;

- Each portion of the action or the action as a whole meets any of the following requirements:

    - Where EPA has approved a revision to an area's attainment or maintenance demonstration after 1990 and the State makes a determination that (1) the total direct and indirect emissions from the action (or portion thereof) result in a level of emissions which, together with all other emissions in the nonattainment (or maintenance) area, would not exceed the emissions budgets specified in the applicable SIP, or (2) the total direct and indirect emissions from the action (or portion thereof) would exceed a SIP budget and the State Governor or the Governor's designee for SIP actions makes a written commitment to USEPA to revise the SIP to achieve the needed emissions reduction;

    - The action (or portion thereof), as determined by the Metropolitan Planning Organization, is specifically included in a current transportation plan and transportation improvement program which have been found to conform to the applicable SIP;

    - The action (or portion thereof) fully offsets its emissions within the same nonattainment or maintenance area through a revision to the applicable SIP or an equally enforceable measure that effects emission reductions equal to or greater than the total of direct and indirect emissions from the action so that there is no net increase in emissions of that pollutant;

[4] It should be noted that the de minimis thresholds for federal actions in severe O3 nonattainment areas are 25 tons per year (tons/year) of VOCs and 25 tons/year of NOx. In 1996, USEPA granted the States of Illinois, Indiana, Michigan, and Wisconsin and exemption from the NOx requirements for O3 nonattainment areas (the Lake Michigan Ozone Study) following section 182(f)(3) of the CAA (61 Federal Register 2,248(1996)). Therefore, the applicable de minimis threshold for the Chicagoland nonattainment area is 25 tons/year of VOC.

[5] 40 CFR 93.158(c) provides that: "Notwithstanding any other requirements of this section, an action subject to this subpart may not be determined to conform to the applicable SIP unless the total of direct and indirect emissions from the action is in compliance or consistent with all relevant requirements and milestones contained in the applicable SIP, such as elements identified as part of the reasonable further progress schedules, assumptions specified in the attainment or maintenance demonstration, prohibitions, numerical emission limits, and work practice requirements."

Notably, all of the analysis required under the General Conformity Rule must be completed, and any mitigation requirements necessary for a finding of conformity must be identified, before a determination of conformity is made.

1.4.2.2 Transportation Conformity Requirements

The Transportation Conformity Rule was established on November 24, 1993. A transportation conformity determination is required for any highway or transit project which is proposed to receive funding assistance and approval through the Federal-Aid Highway program or the Federal mass transit program, or requires Federal Highway Administration (FHWA) or Federal Transit Administration (FTA) approval for some aspect of the project. A transportation conformity determination is not required for individual projects which are not FHWA/FTA projects unless the highway or transit project is of regional significance (40 CFR 51.392). A transportation conformity determination is also required where a MPO is involved in the development, funding, or approval of a transportation plan, program, or project. Although FAA is not directly responsible for transportation conformity determinations, there are coordination requirements concerning off-site impacts of motor vehicles and conformity determinations for local and regional planning.

It is expected that the OMP roadway projects will require transportation conformity analysis, regardless of funding source, unless an individual project is already included in the regional Transportation Improvement Plan (TIP) and it has been demonstrated that the TIP conforms to the one hour O3 SIP.[6]

1.4.3 FAA Orders

FAA Order 1050.1D (Policies and Procedures for Considering Environmental Impacts) assigns responsibility for assuring agency compliance with the environmental provisions of the NEPA. Order 1050.1D provides that when a NEPA analysis is needed, the proposed action's impact on air quality is assessed by evaluating the impact of the proposed action on the AAQS. The proposed action's *build* and *nobuild* emissions are inventoried (including both direct and indirect, reasonably foreseeable emissions) for each reasonable alternative.

At this point, if the emissions do not exceed general conformity thresholds, further analysis is normally not required (further consultation with State and local air quality agencies may be required). If additional analysis is required, the emissions for the proposed build case are translated into pollutant concentrations using a dispersion model. Once this modeling is performed, pollutant concentrations are combined with background concentrations and compared to the AAQS. If concentrations do not exceed the AAQS, the analysis is complete. If concentrations do exceed the AAQS, emissions must be offset, or the action redesigned to reduce emissions.

FAA Order 5050.4A (October 8, 1985) provides guidance for the environmental review of proposed airport development proposals that require federal approval. Compliance with this order signifies compliance with FAA Order 1050.1D. As stated in Order 5050.4A, it is the FAA's objective to enhance environmental quality and avoid or minimize adverse environmental impacts that might result from a proposed federal action in a manner that is consistent with the FAA's principal mission to provide for the safety of aircraft operations. The techniques and methodologies used to perform the air quality analysis of airport actions are described in the FAA's Air Quality Handbook[7].

[6] Per 40 CFR 93.130 and 40 CFR 51.452

[7] Federal Aviation Administration, Air Quality Procedures for Civilian Airports and Air Force Bases. (April, 1997).

Chapter 2 ELEMENTS OF THE ANALYSIS

The air quality analysis will be performed using two techniques—emission inventories and dispersion analysis. This section of the Criteria Pollutant Protocol provides a general discussion of the techniques. A detailed discussion, including a discussion of the assumptions and models that will be used to conduct the OMP air quality analysis is provided in Chapters 3 and 4, respectively.

Table 6 presents a matrix summarizing the years of planned air quality analysis, the types(s) of analysis to be performed for each year, and the OMP project components to be assessed. Notably, both existing (baseline) conditions at the Airport and future conditions with and without the OMP are reflected in the matrix. A discussion of this information is provided in the following sections of this Protocol.

2.1 Emission Inventories

Estimates of emissions of air pollutants by source are known as emission inventories. Emission inventories provide an indication of the relative magnitude of future increases of pollutants (when compared to existing levels) and potential increases/decreases in air pollutants with proposed project alternatives (when compared to a no-action alternative).

To compare emissions directly attributable to the OMP to the de minimis thresholds, inventories of VOC will be prepared to represent annual emissions. The scenarios for which an emission inventory is calculated vary according to the type of analysis being performed (e.g., conformity, and comparison with the AAQS or SIP). For conformity, the "build" and "no-build" emissions are calculated for the same year and the difference in the two inventories are the emissions directly attributable to the project. These "net" emissions are compared to the de minimis threshold to determine if conformity is applicable to the federal action. If the direct and indirect emissions from the action are less than the de minimis levels and the emissions are not regionally significant, the action can be presumed to conform to a SIP, and a conformity determination is not required. If the direct and indirect emissions from the action are greater than the de minimis levels or the emissions are regionally significant, a conformity determination will be performed.

The sources for each scenario also vary depending on the type of analysis being performed. For conformity, the sources are limited to sources not subject to New Source Review (NSR) or Prevention of Significant Deterioration (PSD) permits that the federal agency proposing the action can "practicably control and maintain control over due to a continuing program responsibility". An example of a source that the FAA would be able to practicably control and maintain control over for the OMP are the motor vehicles accessing the Airport.

As shown in **Table 6**, total airport-related emission inventories will be prepared for the existing condition (2001) and for the following future conditions: 2003 through 2013 and 2018. Depending on the year, the inventories will be conducted for operational conditions (including construction emissions if applicable) or construction emissions. The annual inventories will be prepared for the pollutant and pollutant precursors of CO, VOC, NOx, sulfur oxides (SOx), and PM_{10}.

Table 6. OMP Air Quality Elements by Calendar Year

Air Quality Element		Existing (2001)		Future																					
				2003		2004		2005		2006		2007[a]		2008		2009		2010		2011		2012		2013		2018	
		E	D	E	D	E	D	E	D	E	D	E	D	E	D	E	D	E	D	E	D	E	D	E	D	E	D
Existing Conditions and Future No-Action Alternative[b]		*	*									*	*			*	*							*	*	*	*
OMP (Action) Alternative[b]	New Rwy 9L-27R											*	*			*	*							*	*	*	*
	Rwy 18-36 Relocated															*	*							*	*	*	*
	Rwy 10L-28R Extended															*	*										
	Rwy 9R-27L Extended																							*	*	*	*
	Rwy 14L-32R Relocated																							*	*	*	*
	Rwy 14R-32L Relocated																							*	*	*	*
	Western Access																							*	*	*	*
	On-Airport public roadways																							*	*	*	*
	On-Airport service roads											*	*			*	*							*	*	*	*
	Irving Park Road relocated															*	*							*	*	*	*
Construction Emissions				*		*		*		*		*	*	*		*	*	*		*		*		*	*		
General Conformity Determination												*															
Intersection Dispersion Analyses		*										*				*								*		*	

E = emission inventory D = dispersion analysis

[a] Demonstration of conformity required for one-hour O3 SIP.

b Includes emissions from aircraft, ground service vehicles, point sources, motor vehicles (on and off airport), parking facilities, auxiliary power units, and training fires.

2.2 Dispersion Analysis

Dispersion is the process by which atmospheric pollutants disseminate due to wind and vertical stability. The results of a dispersion analysis are used to assess pollutant concentrations at or near an airport. The base data for the dispersion analysis are the emission inventories described in Section 2.1 above. The results of the analysis allow a direct comparison of predicted concentrations of pollutants to the AAQS.

Predicted concentrations resulting from the OMP sources will be added to background concentrations that represent sources in the vicinity of the Airport that will not be included in the modeling effort for the OMP project. As stated in Section 1.3.1 of this Protocol, the airport dispersion model that will be used in the OMP analysis does not have the capability of predicting concentrations of O3 for comparison with the AAQS. As such, the results of the emission inventories will be used to address conformity of the OMP to the one-hour O3 SIP.

Input to computer models for dispersion analysis requires identifying emission sources by their location and by a variance in emission rates according to the hour of the day, day of the week, and month of the year. The models disperse emissions over each period with respect to weather conditions that are also model input. For the OMP analysis, dispersion analysis will be performed to predict levels of pollutants at expected worst-case locations on- and off-Airport property and at existing receptors (sensitive sites) in the vicinity of the Airport. The analysis will be performed including all evaluated sources of air pollutant emissions, including any NSR and PSD permitted sources.

Microscale hot spot dispersion modeling will also be performed. This analysis will be performed for intersections potentially affected by the project. The results of the hot spot analysis will determine if increases in congestion, that may result from the OMP, cause emissions of CO to exceed the AAQS. The microscale analysis will be performed following USEPA's *Guideline for Modeling Carbon Monoxide From Roadway Intersections.*[8]

The airport dispersion analysis will be performed for CO, NOx, SOx, and PM-10. Estimates of nitrogen dioxide (NO2) concentrations will be derived using the NOx results and historical monitoring data in the vicinity of the Airport (see Section 4.5 for additional information regarding the conversion of NOx to NO2). Because airport-related sources are not typically a large source of SOx or SO2 emissions, SOx results will be used as a direct comparison to the SO2 AAQS.

As shown in **Table 6**, to assess the OMP, the dispersion analysis will be performed for the existing condition (2001) and for the following future conditions: 2007, 2009, 2013, and 2018. Concentrations will be predicted for CO, NO2, SO2, and PM_{10} for each of the corresponding averaging times to compare to the AAQS.

[8] Guideline for Modeling Carbon Monoxide from Roadway Intersections. EPA-4454/R-92-05, U.S. EPA OAQPS, Research Triangle Park, NC. November 1992.

Chapter 3 EMISSION INVENTORY ANALYSIS

As stated in Section 2.1, total airport-related emission inventories will be prepared for the existing condition (2001) and for the following future conditions: 2003 through 2013 and 2018. Depending on the year, the inventories will be conducted for operational conditions (including construction emissions if applicable) or construction emissions.

Annual emissions of pollutants and pollutant precursors will be estimated for sources operating at the Airport and from motor vehicles on the major roadways in the vicinity of the Airport. For the purpose of review/use by the IEPA, emissions will also be reported in tons per typical summer week day (for the O3 season—April through October). The pollutants and pollutant precursors that will be inventoried are CO, VOC, NOx, SOx, and PM_{10}. Notably, PM_{10} and $PM_{2.5}$ emission will be evaluated from airport sources, as applicable, using the most recent databases and available tools.

The sources that will be included in the emission inventories are aircraft, auxiliary power units (APUs), ground support equipment (GSE), motor vehicles on airport roadways, parking facilities, and at terminal curbsides; fuel storage and handling; on-site stationary combustion sources including the existing heating and refrigeration plant and space heating facilities, surface coating operations, maintenance activities, and training fires. Motor vehicle emissions on access and egress roads in the vicinity of the airport will also be accounted for.

The FAA's Emissions and Dispersion Modeling System (EDMS) will be used to prepare the inventories. Where necessary and appropriate, the EDMS and EDMS's databases will be supplemented with the USEPA's Guidance for Emissions Inventory Development[9], the MOBILE6.1[10] program , and EPA's AP-42[12] document.

The EDMS is a combined emissions and dispersion model. Use of the model is required by the FAA when evaluating airport-related emissions at civilian airports and military air bases.[13] The model was developed by the FAA in cooperation with the United States Air Force (USAF). EDMS generates an inventory of emissions from sources on and around an airport or air base and calculates pollutant concentrations. It is one of the few air quality assessment tools specifically engineered for the aviation community. Version 4.11 of the EDMS will be used for the evaluation of the OMP.

3.1 Aircraft

The combinations of aircraft and their engines for the various analysis years will be developed. This data will encompass all of the aircraft and engine combinations currently using O'Hare Airport, and will

[9] *Introduction and Use of EIIP Guidance for Emissions Inventory Development*. EPA-454/R-97-004a, U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards, Research Triangle Park, NC. July 1997.
[10] *User's Guide to MOBILE6 (Mobile Source Emission Factor Model)*. U.S. Environmental Protection Agency, Office of Air and Radiation, Office of Mobile Sources, Emission Planning and Strategies Division. Report number EPA-AA-AQAB-94-01. Ann Arbor, MI. May 1994. Revised as MOBILE5b April 1997.
[11] .
[12] *Compilation of Air Pollutant Emission Factors*. AP-42, U.S. Environmental Protection Agency, Fifth Edition (with Supplements), Office of air Quality Planning and Standards, Research Triangle Park, NC, January 1995.
[13] Federal Register, Vol. 63, No. 70/April 13, 1998.

include other new aircraft and candidate engines forecast to be in service in the future. The fleets used in the analysis will be consistent with those used to assess noise impacts with the proposed airport improvements

3.1.1 Aircraft Times in Mode

Default operating times for each mode in an aircraft landing-and-takeoff (LTO) cycle are available in EDMS. These aircraft specific data will be used in the analyses, with the exception of taxi-in, taxi-out, apron idling, and queuing time at the end of the runway. O'Hare specific taxi-in, taxi-out, apron idling, and runway queue delay data will be obtained from the Chicago Department of Aviation's airport simulation modeling and planning group.

3.1.2 Aircraft Operational Levels

Peak month average week day (PMAWD) aircraft operations will be extrapolated to annual aircraft operations using aircraft temporal factors for the existing year (2001) and future years of analysis for commercial, commuter, cargo, general aviation, and military aircraft. The PMAWD is generally considered to be approximately seven percent greater than the average annual condition at O'Hare. This should result in a conservative estimate of aircraft emissions. The O'Hare-specific PMAWD operations will be obtained from the Chicago Department of Aviation's airport simulation modeling and planning group.

3.1.3 Aircraft Temporal Factors (Operational Profiles)

To simulate actual aircraft operations and aircraft queuing characteristics at the Airport throughout an entire calendar year, hour-of-day, day-of-week, and month-of-year, temporal factors will be developed that scale the peak-hour aircraft landing-takeoff cycles (LTOs) to off-peak activity periods. The O'Hare-specific aircraft operational profiles will be developed using data from the Chicago Department of Aviation's airport simulation modeling and planning group.

3.2 Ground Support Equipment (GSE)

Data on the number and type of GSE vehicles servicing the various types of commercial aircraft; the amount of time each piece of equipment spends with individual aircraft; and emission factors for each piece of equipment are available in EDMS. The default emission factors will be used in the OMP analyses. However, O'Hare-specific data for vehicle types and operating times will be used in the analyses, based on the O'Hare GSE Survey conducted for the World Gateway Program Environmental Assessment.

3.3 Motor Vehicles

3.3.1 On-Airport Traffic

Average 24-hour traffic volumes and speeds for the average weekday condition for the on-Airport roadway network will be used in the EDMS. O'Hare-specific on-Airport traffic data will be developed using data from the Chicago Department of Aviation's surface transportation modeling and planning group.

3.3.2 Curbside Traffic

Curbside volumes and vehicle dwell times will be developed for each Airport terminal based on field observations of existing conditions. Demand volumes, average curbside running times, and average

travel speeds for each terminal curbside location will be developed for the average 24-hour condition in each year of analysis. These data will be used in the analyses. O'Hare-specific curbside traffic data will be developed using data from the Chicago Department of Aviation's surface transportation modeling and planning group.

3.3.3 Parking Facilities

Average 24-hour demand volumes, speeds, and average travel distances (or engine-on time) for each major parking facility (including the taxicab and limousine holding areas) will be used. This data will be obtained from City of Chicago records that provide usage rates for current public parking facilities.

3.3.4 Regional Traffic

The emission inventories will include contributions from vehicles on major arterials in the vicinity of the Airport. Therefore, average weekday 24-hour volumes and average travel speeds will be developed for such arterials as I-190, I-90, Bessie Coleman Drive, and Mannheim Road. In addition, the issue of western airport access will introduce a series of new roadway configurations and regional arterials to be assessed in the proposed EIS. Once the plans for the western access are finalized with the FHWA, Illinois DOT, and the Chicago Area Transit System (CATS), the resulting roadway network will be assessed as part of the future build scenarios of the air quality analysis. O'Hare-specific regional traffic data will be developed using data from the Chicago Department of Aviation's surface transportation modeling and planning group.

3.3.5 MOBILE Assumptions

USEPA's MOBILE6.2 program will be used to determine VOC, NOx, and CO emission factors for free-flowing motor vehicles for this project. Idle emission factors will be calculated using USEPA's MOBILE6.2 program and recommended procedure for idle factors contained in the MOBILE5 Information Sheet #2 (dated July 30 1993).[14]

Network specific motor vehicle fleet mixes will be developed for use in MOBILE6.2. The off-Airport network will use a regional mix from IEPA or the national default mix in the MOBILE program. Any data received from CATS for use in the analysis will be coordinated with the IEPA to determine the appropriate/corresponding MOBILE fleet mix. The on-Airport network will use an O'Hare-specific mix; and the parking lots will use their own specific fleet mix that excludes heavy-duty vehicles and motorcycles.

Operating modes, including hot/cold start percentages, will use the MOBILE6.2 national defaults, except that parking lots and links exiting the lots will use a 100% cold start percentage.

The following Chicago nonattainment area-specific MOBILE6.2 files were obtained from the IEPA and will be used in the analysis or used to develop O'Hare-specific data[15]:

- FVMTCH07.def – A file containing vehicle-miles-traveled data by facility type (freeway, arterial, local roads, and ramps) for each hour of the day. Data in this file will be used to create O'Hare-specific data.

[14] *User's Guide to CAL3QHC Version 2.0: A Modeling Methodology for Predicting Pollutant Concentrations Near Roadway Intersections*. U.S. Environmental Protection Agency. Research Triangle Park, NC. Report number EPA-454/R-92-006. November 1992. Revised June 1993.
[15] Sam Long, IEPA, November 22, 2002.

- CHIRD01.d – A file containing the registration distribution of vehicles by year within the Chicago nonattainment area. Differences in this file and default MOBILE6.2 files only exist for light-duty vehicles and light-duty trucks.

- HVMTCH7.sl – A file containing vehicle-miles-traveled by hour of the day. As with the FVMTCH07.def file, the information will be used to create O'Hare-specific data.

- ILLOBDIM.d – A file containing specific data related to the Inspection and Maintenance (I&M) program in the Chicago nonattainment area. It will be assumed that 91.5 percent of the gasoline-powered on-highway traffic in the airport area is subject to the I&M program (to be consistent with IEPA's regional analysis).[16]

- SVMTCH07.def – A file containing vehicle-miles-traveled data by speed by hour of the day. Information in this file will be used to develop O'Hare-specific data.

3.3.6 PART5 Assumptions

USEPA's PART5 program, currently part of the MOBILE program, will be used to determine PM_{10} and SO_2 emission factors for free-flowing motor vehicles. The following assumptions will be used for the PART5 input:

VMT mix:	use O'Hare-specific mixes (as described above)
Mileage accrual rates:	default to PART5 database
Registration distribution:	default to PART5 database
Reformulated gasoline:	all vehicles
Speed cycle:	transient (cyclical)
Average no. of wheels by class:	default to PART5 database
Number of precipitation days:	127 days per year
Trap emission control for buses:	none
Particle size cutoff:	2.5 microns

3.4 Fuel Storage and Handling

The sources of VOC emissions for the storage and handling of fuel include breathing and working losses for storage tanks, and losses from the filling of tanker trucks. VOC emissions from fuel storage and handling will be calculated using the EPA's TANKS[17] model and methodologies.

3.5 Stationary Sources

Stationary sources located on the Airport property that will be accounted for in the air quality analysis include the existing Heating and Refrigeration Plant and boilers used for space heating. Emissions from these sources will be calculated using the FAA's EDMS model and methodologies. Annual fuel use data will be obtained from City of Chicago utility records.

3.6 Construction Activities

Pollutant emissions resulting from activities associated with the construction of the new runways, extended runways, new and extended taxiways, new terminals, Federal Inspection System (FIS) facilities, parking facilities, and roadways will be estimated. Data regarding the number of pieces and

[16] Meeting with IEPA on December 20, 2002.
[17] *User's Guide to TANKS, Storage Tank Emissions Calculation Software Version 4.0.* U.S. Environmental Protection Agency, Office of air Quality Planning and Standards, Research Triangle Park, NC, April 7, 1999.

types of construction equipment to be used on the project, the deployment schedule of equipment (monthly and annually), and the approximate daily operating time (including power level or duty cycle) will be estimated for each individual construction project based on a schedule of construction activity for the OMP. These estimates will be prepared by project phase, by subcomponent, and by month.

The emission inventories for the equipment will be calculated using emission factors obtained from the USEPA's Nonroad Engine and Vehicle Emission Study[18], the NONROAD model (Version 2.2.0)[19] databases and support information, and/or the Compilation of Air Pollutant Emission Factors (AP-42). A later version of NONROAD model will be used if the newer model is available before the analysis begins (the USEPA anticipates releasing a new nonroad engine emission model (NONROAD2000) early in 2003). Use of either model and emission rates for the equipment will be coordinated with the IEPA.

Any potential adverse and temporary air quality effects that may arise during construction, such as fugitive dust emissions and elevated CO levels, will be assessed qualitatively. The assessment will identify mitigation measures to alleviate fugitive dust emissions and potential elevated CO levels due to traffic disruption and subsequent congestion.

3.7 Other Miscellaneous Sources

Other miscellaneous sources that will be addressed in the modeling analysis will include training fires, surface coating (aircraft maintenance) activities, aircraft deicing activities, and other permitted sources. Emissions from these sources will be calculated using the FAA's EDMS model and methodologies, as well as EPA's AP-42 methods and databases.

3.8 Demolition-Related Emissions

As requested by the IEPA in their September 13, 2002 scoping comments, the potential for air pollutant emissions resulting from demolition of residences and businesses will be addressed, including the amount and type of particulate matter and the potential for asbestos emissions.

The proposed project could involve demolition of some structures. IEPA's Notification of Demolition and Renovation (Form IL 532 1296) will be completed for each structure before demolition. Emission estimates of PM_{10} due to demolition will be calculated size of each building and a factor of 0.00042 pounds per PM_{10} per cubic foot of building.[20]

Buildings constructed before 1980 often contain regulated asbestos containing materials (ACM). Following 40 CFR Parts 61 and 763, each building will be inspected for ACM before demolition. The demolition and removal of ACM will comply with all Federal and/or local applicable regulations regarding asbestos and be performed by a licensed contractor.

[18] *Nonroad Engine and Vehicle Emission Study - Report*. U.S. Environmental Protection Agency. Office of Transportation and Air Quality. Research Triangle Park, NC. Report number EPA-460/3-91-02. November 1991.
[19] NONROAD, Version 2.2.0, June, 1998. U.S. Environmental Protection Agency.
[20] South Coast Air Quality Management District, CEQA Air Quality Handbook, May 1993. Table A9-9, Estimating PM10 Emissions from Fugitive Dust.

Chapter 4 DISPERSION ANALYSIS

As stated in Section 2.2, the dispersion analysis will be performed for the existing condition (2001) and for the following future year conditions with and without the Preferred Build Alternative: 2007, 2009, 2013, and 2018[21]. Ambient concentrations of pollutants will be predicted for CO, NO_2, SO_2, and PM_{10} for each of the corresponding averaging times. The concentrations (including appropriate background levels) will then be compared to the AAQS. To assess predicted concentrations with the OMP, the FAA's EDMS computer model will be used. To assess concentrations near intersections, EPA's CAL3QHC model will be used. Using these models, maximum concentrations will be estimated at each receptor location for the following pollutants and averaging times:

- CO: 1-hour and 8-hour,
- SO2: 3-hour, 24-hour, and annual,
- NO2: annual; and
- PM_{10}: 24-hour, and annual.

4.1 Background Concentrations

Dispersion modeling performed for the proposed OMP cannot represent all pollutant sources in proximity to the Airport that contribute to total pollutant levels. Therefore, background concentrations are developed to reflect the emissions from nearby sources. When background concentrations are added to the Airport dispersion modeling results, the results represent total pollutant concentrations at the receptor sites.

The background concentrations that will be used in the evaluation of the proposed OMP were recommended by the IEPA.[22] For averaging periods less than one year, the concentrations are the second highest measured level during a given three-year consecutive period (IEPA evaluated the years 1996 through 2001 and selected a three-year period for each pollutant within this time frame). The values will be used for both the existing condition and future conditions.

Use of these factors will result in conservatively high values for the future given the downward trend in pollutant concentrations within the area. As such, depending on the outcome of the modeling, the future background concentrations may need to be adjusted to reflect less conservative levels. Should this be the case, adjustments to the factors will be made in consultation with the IEPA. Notably, one of the monitoring stations selected by the IEPA to represent background concentrations is located in close proximity to O'Hare (Schiller Park). Use of data from this station may result in conservatively high estimates of CO and NO2.

The background concentrations are provided in **Table 7**.

[21] The dispersion analysis will be performed for NEPA purposes even if a Conformity Determination is accomplished without dispersion analysis.
[22] Email, Rob Kaleel, IEPA, January 6, 2003.

Table 7. Background Concentrations

Pollutant	Averaging Time	Station Selected	Year	Background Concentration	Percent of Standard
CO	1-hour	Schiller Park	1999	4.5 ppm	13
	8-hour	Schiller Park	1999	2.9 ppm	32
NO_2	Annual	Schiller Park	1999	58 ug/m3	58
SO_2	3-hour	Lisle	1999	192 ug/m3	15
	24-hour	Lisle	2000	76 ug/m3	21
	Annual	Lisle	1998	8 ug/m3	10
PM_{10}	24-hour	Bensenville	1998	60 ug/m3	40
	Annual	Bensenville	1998	30 ug/m3	60

Source: IEPA

4.2 Meteorological Parameters

4.2.1. Airport Dispersion Analysis

The dispersion analysis of total airport sources will be based on actual hour-by-hour meteorological data for the Chicago O'Hare Airport as collected by the National Weather Service. Based on discussions with IEPA, year 1990 meteorological data will be used to represent worst-case conditions[23]. Should any of the predicted concentrations be close to (within 10 percent) an applicable standard, additional years of meteorological data will be simulated (after reviewing whether adjustments are appropriate to the applicable background concentration(s)).

4.2.2 Intersection Analysis

Per discussions with IEPA, worst-case meteorological factors will be used to assess concentrations of CO adjacent to intersections. These worst-case factors are:

Temperature – minimum 13 degrees, maximum 29 degrees[24]

Wind Speed – 1 meter/second

Wind Direction – 350 degrees at 10 degree increments

Stability Class – "D" (neutral/slightly stable)

4.3 Receptor Locations

Pollutant concentrations will be predicted at a sufficient number of publicly accessible locations so that the maximum potential concentration of the pollutants is evaluated. Receptors will be placed at the Airport property line at intervals of 5 degrees (approximately 72 receptors or a receptor every 1000 feet). The proposed network will also include approximately 10 discrete receptors to represent locations on Airport property, 15 discrete receptors to represent areas of maximum expected concentrations off Airport (where the public has reasonable access), and 5 discrete receptors in specific communities/locations.

[23] Teleconference with IEPA, November 22, 2002.
[24] Telephone conversation with Walt Zyzniuski, IDOT, February 14, 2003.

The placement of discrete receptors will be based on the following considerations: locations where the general public have reasonable access, the locations of dominant emission sources, distances between sources and receptors, model limitations, and professional judgment.

At each traffic intersection to be analyzed (see Section 4.4 below), receptors will be placed along both sides of each approach to the intersection, at distances of 3 meters, 25 meters, and 50 meters from the cross street in accordance with EPA guidance;[25] and, if applicable, at sensitive locations such as schools, hospitals, etc. in the vicinity of each intersection.

4.4 Traffic Intersection Selection Methodology

The traffic intersection analysis will evaluate up to 15 intersections, including existing intersections and proposed new intersections. The selection of which intersections will be analyzed will be based on the analysis methodology described in the USEPA's "Guideline for Modeling Carbon Monoxide from Roadway Intersections" and coordination with IDOT, CATS, and IEPA. This methodology focuses the evaluation on intersections with an existing or forecast level-of-service (LOS) of D or worse. The LOS D, E, and F intersections are then rank ordered within each LOS category based on total traffic volume and delay. The intersections with the worst combination of volume and LOS are selected for detailed analysis.

Impacts from the selected intersections will be assessed for the existing baseline condition as well as the future No-Build and Preferred Build conditions. Approach volumes, turning movements, and cycle times for the peak hour are being developed for the modeling analysis.

4.4.1 MOBILE6 Assumptions for the Intersection Analysis

USEPA's MOBILE6 program will be used to determine CO emission factors for free-flowing motor vehicles for this project. Idle emission factors will be calculated using USEPA's MOBILE 6.2 and the recommended procedure for idle factors contained in the MOBILE5 Information Sheet #2 (dated July, 30, 1993).

The MOBILE6 parameters will be the same as those for the VOC analysis except for the following changes:

Minimum daily temperature:	13°F
Maximum daily temperature:	29°F
Ambient temperature:	24°F

4.5 Estimating Annual NO_2 Concentrations

Through discussions with IEPA, it was determined that NO2 concentrations would be derived from modeled NOx estimates using the higher result from the following sources:

- The ratio of measured ambient NO2 to NOx concentrations at IEPA's Schiller Park Monitoring station,
- The ratio of measured ambient NO2 to NOx concentrations at IEPA's Cicero monitoring station, or

[25] *Guidelines for Modeling Carbon Monoxide from Roadway Intersections*. U.S. Environmental Protection Agency. Office of Air Quality Planning and Standards. Research Triangle Park, NC. Report number EPA-454/R-92-005. November 1992.

- The default 0.75 NO2 to NOx ratio established in USEPA's Tier 2 Ambient Ratio Method (ARM).[26]

A historical analysis of the NO2 to NOx monitored concentrations at the Schiller Park and Cicero monitoring stations from 1984 to 2001 indicates that the NO2 to NOx ratio ranged from 0.35 to 0.62. Therefore, the analysis will assume the highest of the three ratios, the USEPA default of 0.75. Notably, use of this ratio should result in conservatively high results.

[26] 40 CFR 51, Appendix W.

Chapter 5 MITIGATION

The assessment of air quality mitigation measures will depend on the outcome of the modeling analysis. If required by the NEPA analysis and/or conformity determination, candidate mitigation measures (including design measures, offsets, and emission reduction credits) will be identified and evaluated in the EIS. The effect of all viable measures will be quantitatively and/or qualitatively assessed as appropriate.

Chapter 6 REFERENCES

A number of references will be used to develop the emission estimates and perform the OMP assessment. The references will include, but not be limited to:

- *Air Quality Procedures for Civilian Airports and Air Force Bases*, Federal Aviation Administration, Office of Environment and Energy, April 1997.
- *Determining Conformity of General Federal Actions to State or Federal Implementation Plans, Final Rule*, US Environmental Protection Agency, 40 CFR Part 51, November 30, 1993.
- *Air Pollution Mitigation Measures for Airports and Associated Activity*, California Air Resources Board, May 1994.
- *Technical Data to Support FAA's Advisory Circular on Reducing Emissions From Commercial Aviation*, US Environmental Protection Agency/Federal Aviation Administration, September 29, 1995.
- *General Conformity Guidance for Airports Questions and Answers*, Federal Aviation Administration, Community and Environmental Needs Division and US Environmental Protection Agency, September 25, 2002.
- *Guide for Assessing and Mitigating Air Quality Impacts*, San Joaquin Valley Unified Air Pollution Control District, January 10, 2002.
- *Nonroad Engine and Vehicle Emission Study – Report*, US Environmental Protection Agency, Office of Air and Radiation, November 1991.
- *User's Guide to CAL3QHC Version 2.0: A Modeling Methodology for Predicting Pollutant Concentrations Near Roadway Intersections*, US Environmental Protection Agency, September 1995.
- *User's Guide to MOBILE6.1 and MOBILE6.2: Mobile Source Emission Factor Model*, US Environmental Protection Agency, October 2002.
- *User's Guide to TANKS*, US Environmental Protection Agency, February 20, 1996.
- *Emissions and Dispersion Modeling System (EDMS) Reference Manual*, US Department of Transportation/Federal Aviation Administration, May 2001.
- Aircraft Engine Exhaust Emissions Databank, International Civil Aviation Organization, http://www.qinetiq.com/aircraft.html
- *Nonroad Diesel Emission Standards*, US Environmental Protection Agency, October 2001.
- *Guideline on Air Quality Models*, US Environmental Protection Agency, 40 CFR Part 51, Appendix W. July 7, 2002.

- *Impact of Aircraft Emissions on Air Quality in the Vicinity of Airports*, Federal Aviation Administration, Office of Environment and Energy, July 1980.

- *Airport Environmental Handbook, Order 5050.4A*, Federal Aviation Administration, October 1985.

- *Policies and Procedures for Considering Environmental Impacts, Order 1050.1*, Federal Aviation Administration, December 1986.

- *Aviation and the Environment, Results from a Survey of the Nation's 50 Busiest Commercial Service Airports*, Government Accounting Office, August 2000.

- *Validation of the Federal Aviation Administration's Emission and Dispersion Modeling System: Measurement and Comparison of Local Concentrations*, Federal Aviation Administration/Volpe National Transportation Systems Center, June 2001.

- *1990 Ozone Precursors Emissions Inventory for the Chicago Area*, Illinois State Implementation Plan. Illinois Environmental Protection Agency, November 1993

- *Illinois 1996 Periodic Inventory and Milestone Demonstration*, Illinois Environmental Protection Agency, September 1999,

- *1999 Illinois Periodic Emissions Inventory*, Illinois Environmental Protection Agency, December 2001.

- *Guideline for Modeling Carbon Monoxide from Roadway Intersections,* US Environmental Protection Agency, November 1992.

- *Illinois COSIM-Carbon Monoxide Screen for Intersection Modeling*, Illinois Department of Transportation, August 1999.

- *Draft User's Guide to PART5: A Program for Calculating Particle Emissions from Motor Vehicles*. US Environmental Protection Agency, February 1995.

- *Compilation of Air Pollutant Emission Factors*. AP-42, US Environmental Protection Agency, Fifth Edition (with Supplements), Office of air Quality Planning and Standards, January 1995.